

**CURRICULUM VITAE**  
of  
**DAVID WILLIAM KNOWLES**

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**Education:**

**Ph.D., 1992,** Physics, University of British Columbia, BC, Canada  
**B.Sc.-Honours, 1982,** Physics, University of New South Wales, Australia  
**1976,** Sydney Grammar School, NSW, Australia

**Experience:**

**Biophysicist, Scientist**

Lawrence Berkeley National Laboratory, Berkeley, CA                            1999 - present

**Post Doctoral Fellow**

Lawrence Berkeley National Laboratory, Berkeley, CA                            1994 – 1998

**Physics Instructor**

University College of the Cariboo, Kamloops B.C.                            1993

**Sessional Lecturer**

Physics Dept, University of British Columbia, Vancouver, Canada                            1992

**PhD Graduate Student**

University of British Columbia, Vancouver, Canada                            1987 – 1992

**Awards and Honors:**

Recipient, National Institutes of Health, NCI Award #1 R33 CA118479-01                            2006 - 2009  
Member, Breast Oncology Research Program, UCSF, San Francisco, CA,                            2004 - present  
Recipient, Breast Cancer Research Program Idea Award #DAMD170210440                            2003 - 2006

**Invited Talks:**

**21st Feb 2007, Invited Speaker**, UCSF Biological Imaging Development Center *Three-dimensional morphology and gene expression in the Drosophila blastoderm at cellular resolution.*

**7th Feb 2007, Invited Speaker**, UCSF Comprehensive Cancer Center: Breast Oncology Program.  
*Novel Image-based Screen of Mammary Tumors*

**April 2006, Invited Speaker**, Basic Medical Sciences Departmental Seminar Series, Purdue University *Novel Image-based Screen of Mammary Tumors*

**October 2005**, Genome Informatics, Cold Spring Harbor, New York, Invited Speaker, *Berkeley Drosophila transcription network project: 3D blastoderm gene expression atlas*

**8th August 2005**, IEEE Computational Systems Bioinformatics Conference August 8-11, Stanford University. **Invited tutorial speaker:** *Novel Visualization and Quantitative Analysis Methods in BioImaging*

## **Service:**

**Scientific Study Section Review Panel Member:** NIH, NCI, Innovative Molecular Analysis Technologies (IMAT). 2000-present

**Program Committee Member:** Workshop on Multiscale Biological Imaging, Data Mining & Informatics, Santa Barbara, CA, USA, Sept 7-8, 2006

**Instructor,** Optical Microscopy, Life Sciences Division, LBNL 2002-present

**Reviewer,** Bioinformatics 2002, BioMed Central Bioinformatics 2006

**Instructor,** Daughters and Sons to Work, LBNL, 2003, 2004

**Lecturer,** Friends of LBNL, 2005

**Lecturer,** Center for Science & Engineering Education, at Elizabeth Elementary School and George Washington High School. 2003

**Building Manager and Safety Coordinator (Bld 74 & 84),** Lawrence Berkeley National Lab, 1999 - present.

**LSD EH&S Committee Member,** 2006- present

**Site Council Member and Berkeley Unified School District Representative:** Oxford Elementary School, Berkeley, CA 2006-present

## **Post Doctoral Research:**

As postdoctoral fellow I developing an image-based microrheology experiment where a controlled deformation was applied to the cytoskeleton of human red blood cells and the resulting reorganization of fluorescently labeled membrane components measured. Using this technique, I showed that vesiculation in red cells involves the uncoupling of the cytoskeleton from the lipid bilayer and this process provided an effective mechanism for selectively sorting and trafficking membrane proteins.

## **Ph.D. Research:**

For my Ph.D. I build a fluorescence recovery after photobleaching experiment to measure the *in situ* lateral diffusivity of specific membrane components of the human red blood cell. The work revealed a cooperative action between membrane receptor-proteins which resulted in the transduction of a mechanical signal from outside to inside of a cell causing increased rigidity of the cell's cytoskeleton. The idea that transmembrane proteins profoundly influence the rigidity of the skeletal-network was used to elude a mutation in band 3 responsible for the red blood cell disorder South Asian Ovalocytosis, which because of increased membrane rigidity is resistant to invasion by malaria parasites.

## **Publications:**

1. Charless C. Fowlkes, Cris L. Luengo Hendriks, Soile V. E. Keränen, Gunther H. Weber, Oliver Rubel, Min-Yu Huang, Clara Henriquez, Lisa Simirenko, Mike B. Eisen, Bernd Hamann, **David W. Knowles**, Mark D. Biggin, Jitendra Malik **2008 A quantitative spatiotemporal atlas of gene expression in the *Drosophila* blastoderm**  
**Cell 133:364-374 April 18, 2008**
  
2. Xiaoyong Li, Stewart MacArthur, Richard Bourgon, David Nix, Daniel A. Pollard, Venky N. Iyer, Aaron Hechmer, Lisa Simirenko, Mark Stapleton, Cris L. Luengo Hendriks, Hou Cheng Chu, Nobuo Ogawa, William Inwood, Victor Sementchenko, Amy Beaton, Richard Weiszmann, Susan E. Celniker, **David W. Knowles**, Tom Gingeras, Terence P. Speed, Michael B. Eisen and Mark D. Biggin **2008 Transcription Factors Bind Thousands of Active and Inactive Regions in the *Drosophila* Blastoderm**  
**PLoS Biol. 6, e27 (2008)**

Li et al. resulted in a story, **April 2008**, Magdalena Skipper, “**Gene expression: Of ChIPs and flies**”, Nature Reviews Genetics. <http://www.nature.com/nrg/journal/v9/n4/full/nrg2343.html>

3. Gunther H. Weber, Oliver Rubel, Min-Yu Huang, Angela H. DePace, Charless C. Fowlkes, Soile V. E. Keranen, Cris L. Luengo Hendriks, Hans Hagen, **David W. Knowles**, Jitendra Malik, Mark D. Biggin, Bernd Hamann **2007 Visual Exploration of Three-dimensional Gene Expression Using Physical Views and Linked Abstract Views**  
**IEEE Transactions on Computational Biology and Bioinformatics, 30 August 2007**
4. Cris L. Luengo Hendriks, Soile V. E. Keränen, Mark D. Biggin and **David W. Knowles 2007 Automatic channel unmixing for high-throughput quantitative analysis of fluorescence images**  
**Optics Express 15(19):12306-12317**
5. Luengo Hendriks C.L. & **Knowles D.W. 2007 Comments on the paper ‘A novel 3D wavelet-based filter for visualizing features in noisy biological data’, by Moss et al.**  
**J. Microscopy, 225 (1): 104–107 2007**
6. Cris L Luengo Hendriks, Soile VE Keranen, Charless C Fowlkes, Lisa Simirenko, Gunther H Weber, Angela H DePace, Clara Henriquez, David W Kaszuba, Bernd Hamann, Michael B Eisen, Jitendra Malik, Damir Sudar, Mark D Biggin and **David W Knowles 2006 3D morphology and gene expression in the Drosophila blastoderm at cellular resolution I: data acquisition pipeline**  
**Genome Biology 2006, 7:R123**

Luengo Hendriks et al. 2006 resulted in the following stories:

**January 2007** Louisa Flintoft “**Developmental networks in time and space**” Nature Reviews Genetics. <http://dwknowles.lbl.gov/nrgFeb2007.pdf>  
**February 2007**, Felice Frankel, “**Expressing Genes**”, [www.AmericanScientist.org.](http://dwknowles.lbl.gov/AmericanScientistJan07.pdf)  
<http://dwknowles.lbl.gov/AmericanScientistJan07.pdf>  
**September 2007**, Melissa Lee Phillips wrote “**Deciphering Development: Quantifying Gene Expression through Imaging**”, [www.BioscienceMag.org,](http://dwknowles.lbl.gov/BioScience2007.pdf)  
<http://dwknowles.lbl.gov/BioScience2007.pdf>

7. Soile VE Keranen, Charless C Fowlkes, Cris L Luengo Hendriks, Damir Sudar, **David W Knowles**, Jitendra Malik and Mark D Biggin **2006 3D morphology and gene expression in the Drosophila blastoderm at cellular resolution II: dynamics**  
**Genome Biology 2006, 7:R124**
8. Fuhui Long, Hanchuan Peng, Damir Sudar, Sophie A. Lelièvre, and **David W. Knowles 2007 Phenotype Clustering of Breast Epithelial Cells in Confocal Images based on Nuclear Protein Distribution Analysis** **BMC Cell Biology 2007, 8(Suppl 1):S3**
9. Gurushankar Chandramouly, Patricia C. Abad, **David W. Knowles**, and Sophie A. Lelièvre **2007 Nuclear organization and tissue polarity cooperate to control cell fate in mammary acini**  
**J. Cell Sci. 120, 1596-1606 (2007)**
10. Patricia C. Abad, Jason Lewis, I. Saira Mian, **David W. Knowles**, Jennifer Sturgis, Sunil Badve, Jun Xie, Sophie A. Lelièvre **2007 NuMA Influences Higher Order Chromatin Organization in Human Mammary Epithelium** **Mol. Biol. Cell, 18:348-361 2007**
11. **David W. Knowles**, Damir Sudar, Carol Bator-Kelly, Mina J. Bissell, and Sophie A. Lelièvre **2006 Automated local bright feature image analysis of nuclear protein distribution identifies changes in tissue phenotype** **Proc. Natl. Acad. Sci. USA 103, 4445-4450**

Knowles et al. resulted in a press release “**New cell imaging method identifies aggressive cancer cells early**” <http://news.uns.purdue.edu/UNS/html3month/2006/060306.Lelievre.fluo.html>

12. Koei Chin, Carlos Ortiz de Solorzano, **David Knowles**, Arthur Jones, William Chou, Enrique Garcia Rodriguez, Wen-Lin Kuo, Britt-Marie Ljung, Karen Chew, Kenneth Myambo, Monica Miranda, Sheryl Krig, James Garbe, Martha Stampfer, Paul Yaswen, Joe W. Gray, and Stephen J. Lockett **2004** *In situ analysis of genome instability in breast cancer* **Nat Genet.** **2004** **36:984-8.**
13. Heidi M. Van Dort, **David W. Knowles**, Joel A. Chasis, Gloria Lee, Narla Mohandas, and Philip S. Low **2001** *Analysis of integral membrane protein contributions to the deformability and stability of the human erythrocyte membrane* **J Biol Chem** **2001** **276:46968-74**
14. Michael R. Cho, **David W. Knowles**, Barbara L. Smith, John J. Moulds, Peter Agre Narla Mohandas, David E. Golan **1998** *Membrane dynamics of the water transport protein AQP1 in intact human red cells* **Biophys. J.** **76:1136-1144**
15. **Knowles D.W.**, Tilley L., Mohandas N., Chasis J.A. **1997** *Erythrocyte membrane vesiculation: Model for the molecular mechanism of protein sorting.* **Proc. Natl. Acad. Sci.** **94:12969-12974**
16. **Knowles D.W.**, Chasis J.A., Evans E.A., Mohandas N. **1994** *Cooperative action between band 3 and glycophorin A in human erythrocytes: Immobilization of band 3 induced by antibodies to glycophorin A* **Biophys. J.** **66:1726-1732**  
Knowles et al. 1994 resulted in a story by David E. Golan and Nobel Laureate, Peter Agre, “**Action at a distance: another lesson from the red cell**” **Biophys J.** **1994 May;** **66(5):** 1271–1272.
17. Mohandas N., Winardi R., **Knowles D.**, Leung A., Parra M., George E., Conboy J., Chasis J. **1992** *Molecular basis for membrane rigidity of hereditary ovalocytosis: A novel mechanism involving the cytoplasmic domain of band 3* **J. Clin. Invest.** **89:686-692.**

#### **Peer-Reviewed Proceedings and Book Chapters:**

18. Oliver Rubel, Gunther H. Weber, Member, Min-Yu Huang, E. Wes Bethel, Mark D. Biggin, Charless C. Fowlkes, Cris L. Luengo Hendriks, Soile V. E. Keranen, Michael B. Eisen, **David W. Knowles**, Jitendra Malik, Hans Hagen, and Bernd Hamann **2007** *Integrating Data Clustering and Visualization for the Analysis of 3D Gene Expression Data.* Transactions on Visualization and Computer Graphics, Vol 13, No. 6, November/December 2007 *Submitted*
19. O. Rübel, G.H. Weber, S.V.E. Keränen, C.C. Fowlkes, C.L. Luengo Hendriks, L. Simirenko, N.Y. Shah, M.B. Eisen, M.D. Biggin, H. Hagen, D. Sudar, J. Malik, **D.W. Knowles** and B. Hamann, **2006** *PointCloudXplore: Visual Analysis of 3D Gene Expression Data Using Physical Views and Parallel Coordinates* in: H. Hagen, A. Kerren and P. Dannenmann (eds.), *Visualization of Large and Unstructured Data Sets, Lecture Notes in Informatics*, Vol. S-4, pp. 107-117
20. **Knowles, David W.**, Keranen, Soile, Biggin, Mark D., Sudar, Damir **2002** *Mapping organism expression levels at cellular resolution in developing Drosophila* In Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing IX, Jose-Angel Conchello; Carol J. Cogswell; Tony Wilson; Eds. Proc. SPIE Vol. 4621:57-64
21. **Knowles D.W.**, Keranen S., Biggin M., Sudar S. **2002** *Mapping organism expression levels at cellular resolution in developing Drosophila* In Optical Diagnostics of Living Cells III, Proceedings of SPIE.

22. **David W. Knowles**, Mark D. Biggin, Stephen Richards, Damir Sudar **2001** *Mapping organism expression levels at cellular resolution in developing drosophila* Microsc. Microanal. 7:10-11
23. **David W. Knowles**, Sophie A. Lelièvre, Carlos Ortiz de Solórzano, Stephen J. Lockett, Mina J. Bissell, Damir Sudar **2001** *Quantitative model-based image analysis of NuMA distribution links nuclear organization with cell phenotype* Microsc. Microanal. 7:578-579
24. D. Sudar, D. Callahan, B. Parvin, **D. Knowles**, C. Ortiz de Solorzano, M.H. Barcellos Hoff **2001** *Design of a microscopy system for quantitative spatial and temporal analysis of multicellular interactions* Microsc. Microanal. 7:32-33
25. Rodrigo Fernandez-Gonzalez, Arthur Jones, Enrique Garcia-Rodriguez, **David Knowles**, Damir Sudar, Carlos Ortiz de Solorzano **2001** *A system for computer-based reconstruction of 3-dimensional structures from serial tissue sections: An application to the study of normal and neoplastic mammary gland biology* Microsc. Microanal. 7:964-965
26. **Knowles D.W.**, Ortiz de Solorzano C., Jones A., Lockett S.J. **2000** *Analysis of the 3D spatial organization of cells and sub cellular structures in tissue* In Optical Diagnostics of Living Cells III, Daniel L. Farkas, Robert C. Leif Editors Proceedings of SPIE. Vol 3921:66-73
27. Ortiz de Solorzano C., Chin K., Chou W.S., **Knowles D.**, Gray J.W., Lockett S.J. **1999** *Measurement of genetic instability in breast cancer by confocal microscopy and 3D image analysis* Proceedings BMES/EMBS
28. **Knowles D.W.**, Mohandas N., Ortiz de Solorzano C., Lockett S.J. **1999** *Imaging the lateral distribution of fluorescently labeled membrane components of human erythrocytes under deformation* Microsc. Microanal. 5, 1044-1045
29. Ortiz de Solorzano C., Chin K., **Knowles D.**, Jones A., Garcia E., Gray J.W. Lockett S.J. **1999** *3D confocal microscopy and image analysis for measurement of genetic instability* Microsc. Microanal. 5, 1022-1023
30. Lockett S.J., **Knowles D.W.**, Pinkel D., Ortiz de Solorzano C. **1999** *Quantitative 3D analysis of intra-nuclear organization in the tissue context* Microsc. Microanal. 5, 1320-1321